

Goldschmidt Medal Abstract
**Isotopes in spicules: delving into
deep-sea archives of marine
silicon cycling**

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Dissolved silicon, silicic acid, is an essential nutrient for several marine organisms that contribute to carbon uptake and cycling in the oceans. Silicic acid is released from the weathering of terrestrial rocks and soils, processed through land plants, and flows into the oceans largely through riverine and groundwater inputs. The major oceanic sink of silicic acid is the production of biogenic silica (opal) by diatoms, which are photosynthetic algae that make their intricate shells from amorphous silica that contribute towards a significant proportion of the export of organic carbon out of the surface waters into the deep-ocean. However, diatoms efficiently take up nutrients from surface waters, and rely on upwelling supplies of silicic acid for growth. As such, understanding and quantifying deep ocean silicic acid concentrations and supply mechanisms are essential for understanding diatom productivity in the past, and the interaction between marine biological uptake of carbon dioxide, climate and ocean circulation.

The development of silicon isotope analysis in seawater and biogenic opal has led to advances in our understanding of the silicon biogeochemical cycle. Here, I will be exploring some of the new developments in the use of sponge spicule silicon isotopes as archives of nutrient cycling. I will present some new case studies to illustrate that combined downcore isotope records hold great promise for the reconstruction of water column silicon cycling in the past, constraining not only silicon input and availability but also uptake and utilisation in surface waters. Such reconstructions can shed light on changes in marine ecology and carbon uptake that occur during periods of climatic change.